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# INSTRUCTION PAPER.

FIRST EDITION.

SUBJECT :

# CALCULATIONS.

PART IV.

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## NOTICE.

The student must, in accordance with his agreement, treat this instruction paper as confidential and not allow it to be used by any other person for study or other purposes.

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*Entered according to Act of Congress in the year 1898,*
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1898.

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# CALCULATIONS.

1. Woolen Yarn Counts.

The common method of counting woolen yarns is by the RUN system, which is based on the number of runs of 1600 yards each in one pound, or the number of times that 100 yards are contained in one ounce.

Thus, a 5 run yarn means that $5 \times 1600 = 8{,}000$ yards are contained in one pound.

2. To obtain the weight of a given length of yarn when the "run" is known.

**Rule—Multiply the size of yarn given in "run" counts by 100, and divide the product into the given number of yards; this gives the weight of the yarn in ounces.**

3. Example.

a. What is the weight of 8800 yards of $5\frac{1}{2}$-run in ounces?

$5.5 \times 100 = 550$

$8800 \div 550 = 16$ ozs., or 1 lb. Ans.

b. What is the weight of 5250 yards of 3-run yarn?

$3 \times 100 = 300$

$5250 \div 300 = 17\frac{1}{2}$ ozs. Ans.

4. To find the "run" count when the weight and length are known.

**Rule--Divide the given length in yards by the weight in ounces and by 100 or divide the given length by the weight in pounds and by 1600.**

5. Example.

a. 4000 yards of woolen yarn weigh 5 ozs.; what "run" is it?

$$\frac{4000}{5 \times 100} = 8\text{-run. Ans.}$$

Proof. $8 \times 1600$ yards (standard number) $= 12{,}800$ yards per pound.

$12{,}800 \div 16 = 800$ yards per ounce.

$800 \times 5 = 4000$ yards in 5 ounces.

b. 200,000 yards of "run" yarn weigh 15 lbs.; what "run" is it?

$$\frac{200{,}000}{15 \times 1600} = 8.33 \text{ run.} \quad \text{Ans.}$$

6. To find the length of yarn when the weight and run are given.

**Rule—Multiply the weight in pounds by the run count, and by the standard length, 1600 yards; or multiply the weight in ounces by the run count and by 100.**

Example.

a. What is the length of 350 lbs. of 2-run woolen yarn?

$350 \times 2 \times 1600$ 1,120,000 yards. Ans.

b. How many yards are there in 10 ozs. of 3-run yarn?

$10 \times 3 \times 100 = 3000$ yards. Ans.

7. In Philadelphia and vicinity the numbers of woolen yarn are based on the cut system.

This system is, that for number 1 cut yarn, 300 yds.= 1 lb.

The rules and examples given under the explanation of the "run" system apply to the "cut" system, excepting that one system is based on 1600 yards in one pound and the other 300 yards in one pound.

8. Fine Linen and Jute yarns are based on the above cut system, but instead of the word *cut*, the word Lea is used. The calculations regarding the woolen cut system apply.

9. Coarse Linen and Jute are reckoned by the weight of a spindle, or 14,400 yards; thus, if 14,400 yards weigh 4 lbs., it is 4-lb. counts.

By this system the heavier the yarn is, the higher the counts. This differs from almost all other systems of yarn numbering. Usually a higher number means a finer yarn.

10. Numbering Worsted Yarns. The system of numbering worsted yarn has previously been referred to in Clause 116, Part III, and is based on the system of reckoning 560 yards of number one yarn in one pound. Number two yarn would therefore have $560 \times 2$, or 1120 yards in one pound. 560 yards make one hank.

11. The calculations that have been given for cotton yarns are applicable to worsted yarns, always remembering that the worsted hank has 560 yards, while the cotton has 840 yards.

12. Worsted yarns for warp are almost always two-ply, that is two-fold; thus, 2-ply 24s, 2-ply 50s, etc., meaning that 12 and 25 times 560 yards of the ply yarn respectively weigh one pound.

13. Silk Yarn Numbering.

Spun Silks. (Also see Clause 115, Part III.) These are calculated on the same basis as cotton: 840 yards to the hank. The number of hanks in one pound indicates the counts.

14. There is a material difference however in ply or folded yarns made from silk and cotton. Cotton yarns are marked 2 ply 20s or 2-ply 40s, etc., as they may be required, which means that they are equal to single 10s or single 20s respectively. In silk the count of the yarn is indicated by the size of the resultant or folded numbers, writing after this the numbers of threads that the ply yarn contains. If the numbers are written 20s 2 fold, as the numbers of silk are indicated, it means that the yarn is equal to single 20s after folding, and not 10s as would be meant by the same number in cotton.

30s 3 fold in silk means 3 threads of 90s.

3-ply 30s in cotton means 3 threads of 30s.

15. Cotton, woolen, worsted, fine linen and spun silks are all based on the system of numbering finer yarns by higher numbers.

16. Raw Silks. These are calculated on an entirely different basis from spun silks.

Here the higher the counts or numbers, the coarser the yarn.

The American custom of specifying the size of silk yarns is by giving the weight of 1000 yards in drams avoirdupois. Thus if 1000 yards weighed 6 drams, it would be known as 6-dram silk.

If the yarn is weighed in smaller quantities than 1000 yards then take the weight in proportion; thus, if the skein is 250 yards long and weighs 5 drams, the silk would be 20 dram silk.

17. Previously to being dyed, sflk yarns are subjected to what is called "boiling off," to take out the gum or saliva which the silk worm spins into the single thread.

In this process the yarns lose from 20 to 30 %, according to the class of raw silk used ; China silks lose the most, European and Japan silks the least.

The sizes of yarns are always given for their "gum" weight ; that is, in their condition before boiling off and dyeing.

18. Continental European Numbering of Shappe or Spun Silk. In Switzerland and France Chappe or Shappe silk is reeled in lengths of 500 metres. One skein, of five parts each, of 100 threads, of 1 m. = 500 m. The counts indicate the number of skeins of 500 m. each, that go to one-half kilogramme. In England, Shappe silk is reeled like cotton. One hank seven skeins of 80 threads, of 1½ yards each = 840 yards. The number or counts gives the number of hanks in one pound.

19. **By multiplying the English number by 1.69 the French, Swiss or metric number or count is obtained ; the reverse being effected by multiplying the latter by 0.59.**

20. The system of numbering silk which is in vogue in Europe, and which is used by a number of mills in America, is as follows:

1 skein of 500 meters, weighing .05 grams = 1 denier international ;

or 1 skein of 476 meters, weighing .053 grams = 1 denier Turin system ;

or 1 skein of 476 meters, weighing .051 grams = 1 denier Milan system.

21. Continental European Numbering of Cotton Yarns.

22. French Weights and Measures of Cotton Yarns. The French system of numbering is based on the metric system. The metre (39.37 inches) and the kilogramme (2.204 lbs.) being their standards of length and weight.

23. In numbering yarn, a thread of cotton yarn 1000 metres long, weighing 500 grammes (½ kilo.) is called No. 1.

No. 2 = 2000 metres, weighing 500 grammes.

No. 3 = 3000 metres, weighing 500 grammes.

No. 4 = 4000 metres, weighing 500 grammes,

And so on. This length of 1000 metres is termed a hank (or écheveau) and each hank is divided into 10 skeins (échevettes) of 100 metres each. These skeins are wrapped on a reel having a circumference of 1.425 metres (56.10 inches), making seventy revolutions to a skein.

24. The number of hanks in 500 grammes is the count of cotton yarn.

**Rule.—Divide the metres reeled by twice the weight in grammes = counts French.**

25. Examples for Practice.

a. A woolen skein of one pound weight contains 18,000 yards. What is the count in both run and cut systems?

b. What is the weight of 37,000 yards of yarn in 1s worsted and 1s cotton counts?

c. What is the weight of 10,000 yards of woolen yarn, "run" and "cut" systems, 4s counts?

d. 24 worsted hanks weigh one pound and are 24s counts. What is the number of hanks in cotton for the same length of yarn?

e. How many yards of single yarn are there in a pound of 2 ply 20s cotton?

f. How many yards of single yarn would be required for a pound of 20s 2 fold silk?

g. If 200 yards of raw silk weigh 6 drams, what numbers will it be in the American system?

h. A hank of raw silk weighs $6\frac{1}{2}$ drams (A. S.) How many yards does it contain?

26. Equivalent Counts. To find the equivalent count of one system to that of another system.

**Rule.—Multiply the given counts by the number of yards in the standard length of the specified system, and divide by the number of yards in the standard length of the system required.**

27. Example.

a. Find the equivalent of 15s cotton in woolen and worsted counts.

$\frac{840 \times 15}{1600} = \frac{63}{8} = 7.875$ woolen counts, run system. Ans.

$\frac{840 \times 15}{560} = \frac{45}{2} = 22.5$ worsted counts. Ans.

b. Convert 2-ply 30s worsted to woolen run.

$\frac{2}{30} = 15s \quad \frac{15 \times 560}{1600} = \frac{21}{4} = 5.25$ run. Ans.

c. Find the equivalent of 40s 2 fold silk in single worsted.

$\frac{40 \times 840}{560} = 60s$ worsted. Ans.

d. Convert $4\frac{1}{2}$s run wool to worsted and cotton counts.

$\frac{4.5 \times 1600}{560} = \frac{90}{7}$ 12.85 worsted counts. Ans.

$\frac{4.5 \times 1600}{840} = \frac{60}{7} = 8.57$ cotton counts. Ans.

28. EXAMPLES FOR PRACTICE.

a. Find the equivalent of 2 ply 26s cotton in single worsted counts.

b. Find the number of yards in a pound each of 2 ply 60s cotton, 40s 2 fold silk and 10 run woolen.

c. If a cloth is picked with 48s cotton filling and it is desired to substitute worsted, what counts of filling would be required?

d. How many yards are there in 4 ounces of $5\frac{1}{4}$ run wool yarn?

e. 1120 yards of worsted yarn weigh 2 ounces and are twisted with 1120 yards of another worsted yarn. The resultant count is 12.8s. What is the count of each of the single yarns?

f. What counts of spun silk are equal to 80s cotton?

g. Convert 40s single cotton to worsted.

h. How many yards are there in 8 ounces of a woolen run yarn equal to a 4s cotton?

i. What counts of cotton are equivalent to 90s worsted?

j. Convert number 7 wool "run" to wool "cut" counts.

29. To Find the Numbers of Yarns without Calculations.

The counts of yarn in many materials can be found by counting the number of threads or picks each of a certain length, which collectively weigh one grain. For cotton this length is $4\frac{5}{16}$ inches, worsted $2\frac{7}{8}$ inches, and spun silk $4\frac{5}{16}$ inches.

30. Example.

If a small piece of cloth contains 40 picks, each $4\frac{5}{16}$ inches long of spun silk, and 30 ends of warp each $2\frac{7}{8}$ inches long of worsted, the warp would be 30s worsted and the filling 40s silk.

31. Finding Weight of Yarn.

To find the weight in pounds of a given number of yards of yarn of a known count in any system.

**Rule.— Divide the given number of yards by the count of the yarn and by its standard number of yards per pound.**

32. Examples.

a. What is the weight of 1,126,000 yards of 2 ply 30s worsted yarn?

2-ply 30s $= \frac{1}{15}$s.

$$\frac{1{,}126{,}000}{15 \times 560} = 134.047 \text{ pounds.} \quad \text{Ans.}$$

b. What is the weight of 980,000 yards of 2 ply 30s cotton yarn?

2 ply 30s $= \frac{1}{15}$s.

$$\frac{980{,}000}{15 \times 840} = \frac{700}{9} = 77.77 \text{ pounds.} \quad \text{Ans.}$$

c. What is the weight of 48,000 yards of woolen "run" yarn? Size of yarn 3-run.

$$\frac{48{,}000}{3 \times 1600} = 10 \text{ pounds.} \quad \text{Ans.}$$

d. What is the weight of 48,000 yards of 3-cut yarn?

$$\frac{48{,}000}{3 \times 300} = \frac{160}{3} = 53.33 \text{ pounds.} \quad \text{Ans.}$$

33. If the answer is required in ounces, then multiply the answer by 16, or take it as a whole, and multiply the number of

yards by 16, dividing by the count of the yarn and its standard of length.

EXAMPLE.

Find the weight of 13,800 yards of 32s worsted in ounces.

$$\frac{13{,}800 \times 16}{32 \times 560} = \frac{345}{28} = 12.321 \text{ ounces.} \quad \text{Ans.}$$

34. EXAMPLES FOR PRACTICE.

a. What is the weight of 360,000 yards of 2 ply 30s worsted yarn?

b. What is the weight of 360,000 yards of 2 ply 30s cotton?

c. Find the weight of 12,000 yards of woolen 5-run.

d. What would be the counts of the yarn in the previous example by the "cut" system, the same weight being used?

35. FINDING COUNTS.

To find the counts of any yarn when the length and weight are known.

**Rule. — Divide the number of yards given by the weight in pounds and the number of yards in the standard of the system required.**

36. EXAMPLES.

a. A warp contains 156,000 yards and weighs 20 pounds; find the woolen "run" counts.

$$\frac{156{,}000}{20 \times 1600} = \frac{39}{8} = 4.875 \text{ run.} \quad \text{Ans.}$$

b. Given 120,000 yards, weight 15 pounds; what are the "cut" counts?

$$\frac{120{,}000}{15 \times 300} = \frac{80}{3} = 26.66 \text{ cut.} \quad \text{Ans.}$$

c. Find the worsted and cotton numbers for the length and weight of the previous example.

$$\frac{120{,}000}{15 \times 560} = \frac{100}{7} = 14.28 \text{ worsted counts.} \quad \text{Ans.}$$

$$\frac{120{,}000}{15 \times 840} = \frac{200}{21} = 9.52 \text{ cotton counts.} \quad \text{Ans.}$$

37. Finding Length of Yarn.

To find the length of yarn when the weight and counts are given.

**Rule.— Multiply the weight in pounds by the counts, and by the standard number of yards for the given material.**

38. Examples.

a. Find the length of 20 pounds of 20s cotton.

$20 \times 20 \times 840 = 336{,}000$ yards cotton. Ans.

b. Find length of 20 pounds of worsted 2 ply 20s.

$20 \times 10 \times 560 = 112{,}000$ yards worsted. Ans.

39. Examples for Practice.

a. How many yards of single yarn are there in 30 pounds of 2-ply 28s worsted?

b. How many yards are there of the ply yarn, ignoring contraction in twisting?

c. How many yards of single yarn are there in 10 pounds of 2-ply 60s cotton?

d. Find the length of yarn in 10 pounds of 40s 2 fold silk.

40. Ply, or Double and Twist Yarns.

What has been said in clauses 103 to 113, Part III, Calculations, in regard to cotton yarn will also apply to woolen, worsted and linen yarns, that is with regard to the sizes of yarns twisted together, or to be twisted together.

42. If the yarns that are used are of different materials and based upon different systems of counting it will to necessary to first bring them to one denomination.

43. Example.

A yarn is composed of one thread of 15s worsted and one thread of 10s cotton; what are the resultant counts in worsted?

$$\frac{10 \times 840}{560} = 15 \text{ worsted.}$$

10s cotton equals 15s worsted.

Then

$$\frac{15 \times 15}{15 + 15} = \frac{15}{2} = 7.5\text{s worsted.} \quad \text{Ans.}$$

44. Three-Ply Yarns.

It is very seldom that three or more yarns are used in the same thread, especially different counts of the single threads, but if it is required to make such a combination and calculate the counts, then reduce all to one denomination and proceed as shown in clause 111 and 112 of Part III, Calculations.

45. Examples for Practice.

a. A yarn is composed of one thread of 10s cotton and 26 cut woolen. What are the counts in "cut" numbers?

b. What would be the resulting count of one end of 40s cotton, one of 40s worsted, and one of 60s spun silk twisted together?

c. What are the counts of 36s cotton twisted with 48s worsted? Give the answers in both cotton and worsted systems.

46. Price of Twisted Yarns.

To find the price of two ply yarns, sometimes called double and twist yarns, when the threads to be twisted together are of different values and different counts.

**Rule. — Multiply the highest counts by the price of the lowest counts and the lowest counts by the price of the highest, and divide the sum of the products by the sum of the counts.**

Example.

A 32s yarn costs 42 cents per pound and a 16s yarn costs 18 cents per pound; find the cost of the two twisted together.

$$\begin{array}{rr} 32 \times 18 = 576 \\ 16 \times 42 = 672 \\ \hline 48 \qquad 1248 \end{array}$$

Therefore, $1248 \div 48 = 26$ cents per pound as the cost of the twisted yarn. Ans.

47. If the threads or yarns are of different materials and the counts reckoned on a different basis, then reduce them both to the same denomination and proceed as in the previous example.

48. If three or more threads are twisted together, first find the value of any two, and then the value of the thread resulting from those two with the third.

49. Examples for Practice.

a. What is the price of a twist yarn composed of one thread of 22s yarn at 40 cents per pound, and a 40s yarn at 84 cents per pound?

b. What is the price per pound of a twist thread composed of one thread of 40s worsted at 96 cents per pound, and one thread of 80s 2 fold silk at $5.28 per pound?

c. What would be the size or count of the above twist thread in worsted counts?

50. Finding Weight of Single Yarns to Produce Ply Yarns.

When twisting together two threads of different counts, to find the weight of each required to produce a given weight.

**Rule — Find the counts resulting from the two threads, then, as the counts of one thread is to the resulting counts, so is the total weight to the weight required of that thread.**

51. Example.

What weight of 80s cotton should be twisted with a 32s cotton to produce 100 pounds of double and twist?

$$\frac{80 \times 32}{80 + 32} = 22.857 \text{ resulting count.}$$

Then, as 80 : 22.857 : : 100 : 28.572 of 80s yarn. Ans.

52. **Another rule.— As the sum of the two or more counts is to one of the counts, so is the total weight to the weight of the other count.**

Take the previous example by this method.

80
32

112 : 80 : : 100 : 71.428 of 32s. Or,
112 : 32 : : 100 : 28.572 of 80s. Ans.

If the price of each yarn was given and it was required to find the price per pound of the resulting counts, then multiply the weight of each kind of yarn by its price, add them together and divide by the total weight.

53. Example.

a. Supposing the 80s yarn in the previous example was worth 72 cents per pound and the 32s worth 48 cents per pound,

and the quantities of each yarn, the total cost and the price per pound were required, 100 pounds of material being used. What would be the cost per pound of the yarn?

80
32

112 : 80 : : 100 : $71\frac{3}{7}$ pounds of 32s at 48 cts. = $34.28$\frac{4}{7}$ cost of 32s.
112 : 32 : : 100 : $28\frac{4}{7}$ pounds of 80s at 72 cts. $20.57$\frac{1}{7}$ cost of 80s.

$54.857, total cost.

$54.857 ÷ 100 pounds = 54.9 cents per pound. Ans.

b. Ascertain the price per pound and the quantities of each yarn in 50 pounds of 60s worsted at $1.20 per pound twisted with 28s worsted at 84 cents per pound.

60
28

88 : 60 : : 50 : 34.09 pounds of 28s
88 : 28 : : 50 : 15.9 pounds of 60s.

34.09 pounds of 28s at 84 cents = $28.636
15.9 pounds of 60s at $1.20 = 19.100

Total cost, $47.736

$47.736 ÷ 50 = 95.5 cents per pound. Ans.

54. Examples for Practice.

a. Find the price per pound and the quantities of each yarn in 100 lbs. of yarn made of one thread of 40s 2 fold silk at $2.52 per pound, and one thread of 4-run woolen at 40 cents per pound.

b. A three ply yarn is made from 80s, 40s and 30s worsted, and weighs 100 pounds. What weight would it contain of each count of yarn, and what will be the counts of the three-ply yarn?

c. A warp weighs 45 pounds and is arranged two threads of 14s worsted and one thread of 4-run woolen. What is the weight of each kind of yarn?

# *The American Correspondence School of Textiles.*

## *Examination Paper.—Calculations.—Part IV.*

For instructions as to answering these questions refer to the sheet of rules sent with your first instruction paper.

Where definitions are called for, do not use the same words as are given in the lesson.

In addition to asking you for answers to the following questions, we may require you to show the working of the "Examples for Practice" from the lessons, to see how you arrive at the answers given in the key.

You need not send these in unless called for, but perform the work neatly and retain it.

(Express your answers in decimals to three places.)

EXAMINATION QUESTIONS.

1.—Explain the word "counts," and give other names that are used.

2.—State what is meant by "ply yarn," and give other names that are used for the same purpose.

3.—State how many yards there are in one pound by each of the following systems, the counts of the yarn being single 5's: Woolen "run" and "cut"; linen, cotton, silk, spun and raw; and worsted.

4.—What is the weight of 4000 yards of 1 run yarn in ounces?

5.—How many yards are there in 7 pounds of 3 cut yarn?

6.—If 368,000 yards of worsted yarn weigh 16 pounds, what are the counts?

7.—State the method of writing the counts of silk ply yarn, and also the difference between the cotton and silk systems of counting ply yarn.

8.—What counts are the single threads in a 2 ply 30's worsted yarn?

9.—How many yards of single 40's worsted yarn would be required to produce 50 pounds of 2 ply 40's worsted, ignoring contraction in twisting?

10.—Given 760,000 yards of yarn, calculate the counts in worsted, cotton, silk and linen, the weight being 20 pounds.

11.—What is the difference between the systems of counting raw and spun silks, and how would you indicate the counts of the latter?

12.—State those systems of yarn numbering in which the finer the yarn the higher are the counts, and also those in which the reverse is the case.

13.—Find the 2-ply counts in the woolen, worsted and cotton systems equal to 36's 2 fold silk.

14.—How can the counts of yarn be got without calculations, in silk and worsted?

15.—What is the weight of 360,000 yards of yarn 2 ply 36's worsted, or 2 ply 48's cotton, or 5 run woolen?

16.—How many ounces of yarn are there in 14,000 yards of 2 ply 36's worsted?

17.—State how you would find the size or counts of two or three threads twisted together.

18.—Change 2 ply 40's worsted to cotton counts.

19.—What would be the length of 18 pounds of 8's yarn in the worsted, cotton, and "run" woolen systems?

20.—What count would be required to twist with single 14's to produce a two ply thread equal to a 10's?

21.—What weight of 60's worsted would be required to produce 120 pounds of twist yarn when twisted with a thread of 38's worsted?

22.—State how to find the price per pound and the quantities of each yarn when the weight required and counts are known; also the price of the separate threads. Give an example.

23.—What is the price per pound and the quantities of each yarn in 120 pounds of twist composed of one thread of 36's cotton and one thread of 54's worsted, price of cotton 4 cents per ounce, price of worsted 8 cents per ounce? Also state the cost of the cotton and worsted yarn in bulk.

24.—What count of cotton yarn would be twisted with a 40's to make a two ply yarn equal to a 24's?

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25.—If three ends of 30's yarn and one end of [illegible] together, what would be the weight of each yarn in [illegible]

26.—A given length of yarn weighs 70 pounds, a[illegible] ends of 24's and one of 9's, what weight of each will [illegible]

27.—300,000 yards of woolen yarn weigh 50 pounds. What are the counts in both the "run" and "cut" systems?

28.—What size of silk would 100 yards be if it weighed ¼ of a dram?

29.—How would you find the counts of a ply yarn made of two or more single threads of different materials?

30.—State how to find the weight of each thread when the total weight and the counts of the separate threads are given.

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## *Key.*

Answers to Questions.—Calculations.—Part IV.—First Edition.

Clause 25.
- a. 11.25 run; 60 cut.
- b. 66.071 worsted; 44.047 cotton.
- c. 1.562 pounds "run" yarn; 8.333 "cut" yarn.
- d. 16.
- e. 16,800.
- f. 33,600.
- g. 30 dram silk.
- h. 1000.

Clause 28.
- a. 19.5.
- b. 25,200 yards of cotton.
  33,600 yards of silk.
  16,000 yards of "run" woolen.
- c. 72.
- d. 2100 yards.
- e. 16's counts, first 64's counts, second thread.
- f. The same, 80's.
- g. 60's.
- h. 882 yards.
- i. 60's.
- j. 37.333.

Clause 34.
- a. 42.857.
- b. 28.571.
- c. 1.5 pounds, or 24 ounces.
- d. 26.666 cuts.

Clause 39.
- a. 470,400.
- b. 235,200.
- c. 504,000.
- d. 336,000.

Clause 45.
- a. 13.481, or 2 ply 27 "cut."
- b. 12.631.
- c. 25.41's worsted; 17's cotton.

Clause 49.
- a. 55.6 cents.
- b. 204 cents per pound.
- c. 30's.

Clause 54.
- a. 73.92 cents.
  84 pounds of woolen.
  16 pounds of silk.
- b. 14.117 counts of yarn.
  17.647 pounds of 80's yarn.
  35.294 pounds of 40's yarn.
  47.058 pounds of 30's yarn.
  99.999, or 100 pounds total weight.
- c. 27.907 pounds of worsted yarn.
  17.093 pounds of woolen yarn.

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